

**TRANSLATION**

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b>	See Form PCT/IPEA/416
International application No. <b>PCT/RU2005/000170</b>	International filing date ( <i>day/month/year</i> ) <b>05.04.2005</b>	Priority date ( <i>day/month/year</i> ) <b>03.09.2004</b>
International Patent Classification (IPC) or national classification and IPC <b>G21C 7/08, 7/12, 7/36, 9/02</b>		
Applicant <b>KUDRYAVTSEV, Mikhail Yurievich</b>		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of _____ sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> ( <i>sent to the applicant and to the International Bureau</i> ) a total of <b>2</b> sheets, as follows: <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> ( <i>sent to the International Bureau only</i> ) a total of _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/RU	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/RU2005/000170

## Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed
- ☐ the translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rule 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rule 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-23 as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- nos. \_\_\_\_\_ as originally filed/furnished
- nos.\* \_\_\_\_\_ as amended (together with any statement) under Article 19
- nos.\* 24-25 received by this Authority on 07.10.2005
- nos.\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- sheets 1/1 as originally filed/furnished
- sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (specify): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (specify): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (specify): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/RU2005/000170

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	<u>1-8</u>	YES
	Claims	<u></u>	NO
Inventive step (IS)	Claims	<u>1-8</u>	YES
	Claims	<u></u>	NO
Industrial applicability (IA)	Claims	<u>1-8</u>	YES
	Claims	<u></u>	NO
2. Citations and explanations (Rule 70.7)			
<p>The following documents referred to in the search report have been taken into consideration:</p>			
D1: US 5818892 A			
D2: RU 2190264 c2			
D3: IONAYTIS R.R. et al. Priamodeystvuyushchaya avariynaya zashchita, Atomnaya tehnica za rubezhom, Energoatomizdat, 1988, p.10-16,			
D4: US 4747998 A,			
D5: US 4880596 A.			
<p>D1 is the prior art closest to independent claim 1 and discloses a system for controlling a shell-type nuclear reactor comprising a set of technical means, which is used for limiting the rate of the increment in reactivity by operating devices and for automatically stopping the nuclear reactor, and is provided with drives consisting of motors and connections and used for transmitting a movement from the drive motors to the operating devices arranged inside the reactor body.</p>			
<p>D2 discloses a nuclear reactor provided with fixed elements which are arranged inside the body thereof and are used for engaging and disengaging the operating devices in such a way that, after disengagement, said</p>			

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

operating devices are displaceable by gravity only in a direction of a decrement in reactivity, wherein said operating devices are embodied in the form of reactivity-controlling rods longitudinally displaceable from one end position to the other without stopping at intermediate positions and without controlling the intermediate positions of the operating devices when a low influence is produced on reactivity by each individual operating device.

D3 is the prior art closest to independent claim 5 and discloses a set of technical means which comprises a two-position switch for nuclear reactor passive protection having two fixed states dependent on the position of the switch control element with respect to a critical position corresponding to a critical value attained by one of the parameters defining the normal operational limits of the reactor (a heat carrier reduced consumption and temperature increase, pressure modification, a neutron flow increase).

D4 discloses a two-position switch for a nuclear reactor passive protection whose control element is embodied in such a way that the switch is displaceable from one state to the other when the critical temperature value is attained inside the reactor body.

D5 also discloses a nuclear reactor protection switch whose control element is embodied in such a way that is displaceable from one position to the other when the critical temperature value of a coolant and a neutron flow is attained.

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

The claimed invention according to claim 1 differs from the known D1-D2 in that each operating device is provided with at least two drives, one of which is common for all the operating devices or for the group thereof and displaces said operating devices in the direction of the increment in reactivity until they are engaged with the fixed elements only one-by-one, after the motor thereof is connected to the selected operating device, and the other drive is individual for each operating device and disengages the operating device from the fixed element in any order with respect to the other operating devices. The connections of the individual drive motors with coupling elements are provided with controllable breaking elements which are located in the reactor body and are embodied, for example, in the form of a muff in such a way that it makes it possible to break the connections for displacing the operating devices in the direction of the decrement in reactivity. The connections of the common drive motors with the operating devices are provided with breaking elements which are located inside the reactor body near the joint thereof and are embodied, for example, in the form of a muff in such a way that it makes it possible to break the connections when the reactor body joint is released, and the control elements of the two-position switches are embodied in such a way that they are displaceable by the common drive, when the connection of the motor thereof is coupled with the selected operating device, only in the direction corresponding to the increment in reactivity when the critical values of the determined parameters are attained.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

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Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

The claimed invention according to claim 5 differs from D3-D5 in that the control element is embodied in such a way that the two-position switch is displaceable from one state to the other when the critical values of the following parameters are attained: the thermal elongation of fuel elements of the nuclear reactor and/or the reactor coolant density and/or the reactor coolant corrosion activity.

The technical result makes it possible to increase the reliability of the nuclear reactor in the normal operation thereof by precluding the switch of the reactor operation into a mode violating the normal operation limits at a sixteen-hour subversive control of the nuclear reactor.

Said characterising features are not obvious from the above listed documents.

The claimed invention meets the requirement of novelty and inventive step insofar as the identified characterising features are not obvious from the prior art for attaining the claimed technical result.

All claims of the invention are industrially applicable.